Comment on: Direct space-time observation of pulse tunneling in an electromagnetic band gap, by S.Doiron, A.Hache, H.Winful [1]

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The title of this article is misleading. The authors have investigated a resonator but not a tunneling barrier see also Refs.[2] The measured superluminal group velocity and discussed is that studied on a Lorentz-Lorenz oscillator by Sommerfeld and Brillouin a hundred years ago [3]. It is similar to the faster than light experiment by Wang et al. based also on anomalous dispersion with a complex refractive index of a resonator [4].

Tunneling, however, is understood and performed by electromagnetic evanescent modes or by tunneling solutions of the Schrödinger equation, which have purely imaginary wave numbers. The latter includes a purely imaginary refractive index. Signals with purely evanescent frequency components can travel at a superluminal velocity [5, 6]. Inside the barrier tunneling proceeds even instantaneously, i.e.by a process described by virtual photons [7].

Actually, in the paper there are some errors: Fig.3 shows the vacuum light velocity and in section (II,D) the dwell time is not directly measured but it is derived from an approximately integrated stored energy and from the measured input power. In addition it is claimed to have measured a resonator decay time, but detectors measure the traversal time of a black box independent of the content of the box. The authors are asking *whether an identifiable pulse peak actually propagates through the barrier?* According to their Fig.1 not only the peak but also the pulse half width (for instance representing a digital signal) propagated faster than light and were correctly detected. Remember a signal does not depend on its magnitude as long as it is above the noise level.

References

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